

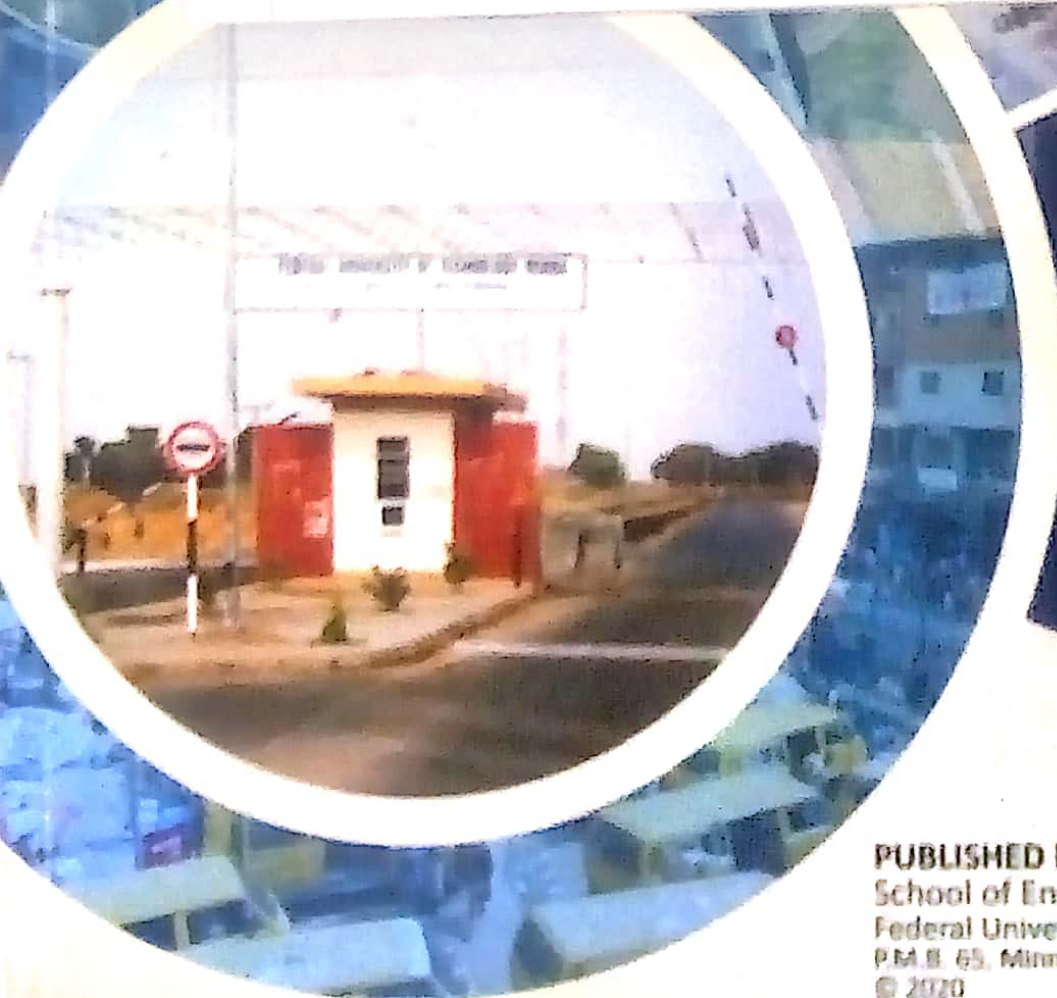


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Effects of Material Management on the Delivery of Building Construction Projects in Minna

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Studies revealed that improper materials management can affect the general performance of construction projects in respect to cost, time, quality and productivity. This study evaluated the effects of material management on the delivery of building construction projects in Niger State with a view to improving the cost and time performance of construction projects. Data were collected from professionals in four (4) Government Ministries in Minna who are in-charge of the execution of housing and construction projects with the use of questionnaire which was administered to 86 professionals. The study found that lack of proper work plan with relative importance index (RII) of 0.84 is the most important barrier to effective material management in building construction projects while the most significant impact of material management on the cost delivery of construction projects is better cash flow management with mean item score of 4.31. In a related development, planning the project budget with a mean item score of 4.61 is the most effective cost control technique for improving material management in construction projects. It was concluded that cost control techniques for improving material management in construction projects are effective and therefore, material management has a significant effect on the delivery of building construction projects. It was thus recommended that all relevant stakeholders should ensure total implementation of the cost control techniques for improving material management in construction projects in order to avoid cost and time overrun.

Keywords: Construction Projects, Cost Control, Material Management.

Introduction

The success of a construction project depends upon having the right people with the right skills and equipment that are able to deliver the project on time and budget. In addition, Donyani and Flanagan (2009) reported that it is equally important to have the right materials in the right place at the right time, the cash flow and capital to adequately procure the labour and materials required. In spite of the fact that materials can represent anything from 30-70% of the cost of work on a project, yet material management has not received adequate attention from researchers (Donyani & Flanagan, 2009). Material management is the system for planning and controlling to ensure that the right quality and quantity of

materials and equipment are specified in a timely manner. Furthermore, materials should be obtained at a reasonable cost and be available for use when needed. Material management includes procurement, shop fabrication, logistics, supply chain management, production on site and field servicing. All of these items require special attention in order to achieve cost reduction through materials' waste reduction on site (Donyani & Flanagan, 2009).

Waste of construction materials on site refers to the difference between materials delivered to site and those that are actually used for construction work. Furthermore, waste can be defined as any losses produced by activities that generate direct or indirect

cost, but do not add value to the product (Ayegba, 2013). Rational management of materials to avoid waste is an important consideration for reducing construction cost and construction duration. Therefore, there is a need for efficient materials management in order to control productivity and cost in construction projects. Materials management is a process that coordinates planning, assessing the requirement sourcing, purchasing, storing, transporting, and controlling of materials, minimising the wastage and optimizing the productivity by reducing cost of materials in ways that are cost effective. So, materials management system attempts to ensure that the right quality and quantity of materials are appropriately selected, purchased, delivered, and handled on site in a timely manner and at a reasonable cost (Ayegba, 2013). Therefore, as a result of the complex nature of works undertaken by construction firms coupled with the need for effective material management on site, cost and time need to be effectively monitored and controlled if the anticipated profit margin will be realised for the contractor. This is required to ensure that projects are completed within the budgeted cost of the client. The prevailing availability of cash over short term has the potential to influence the stand taken by both clients and contractors in respect of management of project cost. To safeguard their primary objectives of survival, growth and profitability, contracting organisations should put in place an effective cost management system within the structure of their organisations for effective project delivery.

According to Sheriff *et al.* (2015), cost control of a project involves the measuring and controlling the cost records of a project and work progress, which also involves the comparison of actual progress with the planning. Sheriff *et al.* (2015) stressed further that a project control system should be established for each capital project. The scope and detail of the control system should be based on the size, complexity, and sensitivity and execution strategy of the specific project. Each project control system

should include a cost management process that estimates, monitors, predicts and reports project cost; a project scheduling management process that plans project activities, monitors completion of these activities, predicts timing of future activities and reports schedule status. Change management process that estimates the change impact, enable and documents the change decision, and integrate the change into the project scope of work to realise a cost effective way of executing works at building project sites. This can only be achieved through a well-defined system for planning and controlling to ensure that the right quality and quantity of materials and equipment are specified in a timely manner. It is in the light of this, it is imperative to undertake a research to evaluate the effect of material management on the delivery of building construction projects.

Kasim (2010) identified improper construction materials management as a factor affecting the general performance of construction projects in respect to construction time, quality, cost and overall construction productivity. Rivas (2011) reported that late delivery of construction materials, unavailability of materials before commencement of construction work, and the long distance of materials from the work location is the principal causes of materials related problems on construction sites. Management of materials among sub-contractors are an issue almost on each construction site; materials are sometimes needed to be lifted from one place to another on the site resulting in additional cost of manpower and machinery (Anwar *et al.*, 2015). Pauline (2014) also reported that difficulty to store materials on site due to limited space is another problem in connection with material management; sometime machineries cannot be adjusted on site due to acute space or mismanagement of site activities. Other problems identified in literature include: conflict among sub-contractors and difficulty to coordinate their materials, late delivery of ordered materials, cash flow problem to contractor due to delayed payments, rejection of materials due to non-

compliance to specification and improper health and safety procedure should injuries occur.

In view of the above, in the construction industry, it is observed that many contractors are facing the problem of exercising cost control on materials management during construction activities which automatically results in time and cost overrun in building projects. In order to address this problem, this study carried out an evaluation of the effects of materials management on the delivery of building construction projects in Niger State with a view to improving the cost and time performance of construction projects.

Literature Review

Barriers to Effective Material Management in the Construction Industry

Problems related to managing the flow of materials can be found in every organisation. The proficient management of materials acts as a key function in the successful completion of a project. The organising to materials is a very important and fundamental subject for every company and should be handled efficiently for the successful completion of a project. Consequences of material departures are: Time deviations, Quality deviations, Quantity deviations, Product deviations. Materials are vital in the procedures in every industry since unavailability of materials can impede production. Unavailability of materials is not the only phase that can cause problems. Excessive quantities of materials could also make serious problems for managers. Storage of materials can raise the costs of production and the overall cost of the project.

According to Donyani and Flanagan (2009), materials management can be divided into five categories. These are: measurement and specification; procurement and purchasing process where the order is transmitted to the supplier; delivery to site and logistics of checking the order, offloading, and storing on site; administrative and financial process of payment; and using the materials in

production on the job site and removing the waste. In terms of purchasing and supply of materials, not matching materials with the ordering purchase, forgetting ordering material over or less adequate management, lack of communication and relation between contractor and supply chain companies are the main obstacles to effective material management (Donyani & Flanagan, 2009). Some other common problems confronting material management on construction sites are namely: failure to order on time which delays the projects; delivery at the wrong time which interrupts the work schedule; over ordering; wrong materials or error in direction of materials requiring re-work; theft of materials; and double handling of materials. In terms of logistics, the main problems are wrong time of materials arriving to the site or wrong quality, lack of information for materials arrival to the site or site stock, missing materials, unavailability of storage space, and waste of labour for materials searching on site.

According to Kasim (2010), there are many issues which contribute to poor materials management in construction projects. Waste, transport difficulties, improper handling on site, misuse of the specification, lack of a proper work plan, inappropriate materials delivery and excessive paper work adversely affect materials management. All these issues lead to wastage and shortage of materials which result to delay in managing materials on construction sites. In addition to the afore mentioned, some other issues relating to materials management are: receiving materials before they are required, causing more inventory cost and changes of deterioration in quality; not receiving materials at the time of requirement, causing loss of productivity; incorrect materials take off from drawings and design documents.

Impact of Poor Material Management on Cost and Time Delivery of Construction Projects

In construction industry, one of the common challenges people face is with their material management. Poor material management can lead to issues with the timeline for the entire project. According to Adafin *et al.*

(2010), construction material management is of central importance to the economic development of the construction industry. Ajayi *et al.* (2017) also identified material management as an integrated process of designing, constructing new structures or remodelling existing structures, using materials more efficiently with a great importance of contributing to construction industry's performance improvement as well as solving material waste management problems. Several authors have shown that material waste from the construction firm represent a relatively large percentage of the production costs (Saidu & Shakantu, 2016). The poor material management of materials leads to an increase in the total cost of building project (Ameh & Itodo, 2013).

However, it is not ideal to commence a project without adequate supply of materials and effective planning of the materials required for project execution. This has the advantage of fostering a good relationship with the suppliers who should be selected due to the fulfilment of the standards required to meet the delivery time over a number of years (Adeyinka *et al.*, 2014). In the light of this, effective practice of material management plays a key role in the successful completion of a project. The impact of effective materials management practices on construction projects includes:

- i. **Environmental impact:** This includes the conservation of natural resources, reduction of energy consumption, conservation of landfill space and reduction of environmental impacts across the life cycle by decreasing the demand for virgin products (Van Ewijk & Stegemann, 2016).
- ii. **Economic impact:** It includes reduction in disposal costs and may reduce transportation of material costs which leads to reducing overall project costs, reduction in purchasing costs since non-virgin materials are often less expensive than virgin resources, make contractors to be more competitive with their bids at reduced costs and it creates employment opportunity and economic activities in the reuse and recycling industries (Beacon, 2008).

- iii. **Performance impact:** This includes reclamation of salvaged or reused materials which can perform as well as or better than virgin products in many applications, reduction in the overall costs of materials, better handling of materials, reduction in duplicated orders, materials will be on site when needed and in the quantities required. There will be improvements in labour productivity, improvements in project schedule, quality control, better field material control, better relations with suppliers, reduction in materials surplus, reduced storage of materials on site, labour savings, stock reduction, purchase savings and better cash flow management (Jensen, 2014).

Other impacts of material management practices that could benefit construction industry includes: reduce cost of materials, improvements in productivity, project will be constructed on time or than expected, purchase saving, providing adequate storage of material on site, improvements in project schedule, reduced materials wastage and better cash flow management (Albert, 2014). According to Patel and Vyas (2011), the benchmarking process prescribed for effective material management in construction projects includes: planning; purchasing; receiving; inspection; stocking and storage; issuing materials; and inventory control. In a related study, Panle and Satihuddin (2015) added that material management process should be initiated from the needs generated from the construction site. The information gathered from these needs is then conveyed to Stores Department and materials is thereafter ordered from the store. Lastly, Satihuddin (2015) reported that vendor selection can then be carried out for the least value and best items.

Effective Cost Control Techniques for Improving Materials Management in Construction Projects
Material control aims at eliminating and minimizing all kinds of wastes and losses, while the materials are being purchased, stored, handled, issued or consumed. A

number of techniques are used in planning, procuring and holding stage of material which help in exercising and effecting material cost control. At the same time, construction activities will generate big amount of the waste and it will cause difficulties in the industry. However, with the proper planning of material management, which is efficient and effective will help to reduce the waste of materials during construction project and within the site. This will in turn increase the profitability of the industry. The Nigerian construction industry continues to occupy an important position in the nation's economy even though it contributes less than the manufacturing or other service industries (Aibinu & Jagboro, 2002). The contribution of the construction industry to national economic growth necessitates improved efficiency in the industry by means of cost effectiveness and timeliness, and would certainly contribute to cost savings for the country as a whole. It is also common knowledge that the implementation of the construction project in the industry is usually accompanied with poor quality delivery and delivery time delay and cost increase as well as owner dissatisfaction (Hafez, 2011). Thus, the efficient use and management of material have an important influence on a company's profit and can delay project construction, (Abdul-Rahman & Alidrisyi, 1994). Material management is a planned procedure that includes, the purchasing, delivery, handling and minimization of waste with the aim of ensuring that requirements are met (Illingworth & Thain, 2011).

According to Culvert (2010), a detailed material schedule and co-ordination of the requisition and order of material are important in ensuring material availability. Efficient material planning is a key to high productivity on site. Material planning embraces quantifying, ordering and scheduling productivity will suffer if the material planning process is not executed properly. Bell and Stukhart (2007) reported a total concept for a material management system (mms), which combined and

integrated the take-off, under evaluation, purchasing expediting and warehousing and distribution functions of material. The system resulted in improved labour productivity, manpower and cost saving. Al-Jibouri (2002) described a computer simulation model, which help to solve the problem of order and deliveries of materials in real life by keeping a predetermined list of order and delivery time of all the materials on site. The delivery of each kind of ineffective materials management for projects can result in significant cost blow-outs and delays in project completion. Such cost inefficiencies will negatively impact global competitiveness and owner operators and engineering, procurement and construction companies are trying to streamline work processes for their projects. Inaccurate materials information, such as incorrect bills of materials, inaccurate cycle counts, shipping errors, receiving errors and so on, will also affect the overall project life cycle and increase project cost. Having to deal with subcontractors outside of the materials management process impacts the overall project supply chain as there is an increased risk of data inconsistencies.

Material management is the system for planning and controlling to ensure that the right quality and quantity of material and equipment are specified in a timely manner. Materials should be obtained at a reasonable cost, and be available for use when needed. The cost of materials represents a large proportion of the cost. A good management system for materials management will lead to benefits for construction. Cash flow has become crucial for the survival of any business, if materials are purchased early. Capital may be tied up and interest charges incurred for the excess inventory of material. Material may deteriorate during storage or be stolen; also delays and extra expenses may be incurred if materials required for particular activities are not available. Modern methods of material management have been embraced by the manufacturers across a wide range of industry sectors outside of construction (Kaming *et al.*, 1997).

According to Sheriff *et al.* (2015), cost control is the processing of raw information received from projects, operating divisions, and special staff division and relating this information to various project cost estimates and schedules for the purpose of presentation of result in the form of reports to all levels of company management, the client and outside agencies. Also, cost control of a project involves the measuring and collecting the cost record of a project and work progress it involves the comparison of actual project with the planning the objective of cost control of a project is to gain the maximum profit within the designated period and satisfactory quality of work. In view of this, the application of cost control practice on site activities will bring about effective site materials management. The main cost control techniques that can be used to achieve this are: Planning the Budget; Keeping a Track of Cost; Effective Time Management; Project Change Control; and Use of Earned Value.

Research Methodology

This study adopted the quantitative research approach. This approach was adopted because it gives room for objective reasoning about an issue and reporting the outcome in numeric terms. In line with this, Kothari (2004) described a quantitative research to involve data generation in a quantitative form which can be subjected in a formal and rigid fashion to rigorous quantitative analysis. The use of structured questionnaire based on a five-point Likert Scale format was employed to collect data. Research population is generally a large collection of individuals or objects that is the main focus of a scientific query; it refers to the total number of the considerable population for the research (Morenikeji, 2006). In the light of this, the population for the study is comprised of registered professionals in government owned Ministries such as the Ministry of Works, Land and Housing; Niger State Housing Corporation; Niger State Geographic Information System Agency (NIGIS); and Niger State Urban Development Board in Niger State. The research population

according to the data obtained was 111 (one hundred and eleven) professionals. The sampling frame for this study covers professionals in these Ministries which involve Architects, Quantity Surveyors, Builders, Estate Surveyors, Town Planners, Electrical Engineers, Mechanical Engineers and Civil Engineers. The criteria for selecting these professionals are years of experience of at least 5 years and above and actively participating in ongoing projects. All the respondents met these criteria. The sample size for this study is 86 because according to Krejcie and Morgan's (1970) table, the sample size for a population size of 110 is 86. Since the nearest value to the population size (111) in Krejcie and Morgan's table was 110, then 86 was used as the sample size. The use of simple random sampling technique was adopted in order to make the sample representative of the population. Analysis of data collected was carried out using percentage, Relative Importance Index (RII) and Mean Item Score (MIS).

The formula for calculating RII and MIS for data analysis is expressed in Equations 1 and 2 as follows:

i. Relative Importance Index

Relative Importance Index is being ranked from 0.00 to 1.00 and they all have their decision rule as shown in Table 2. The formula for Relative Importance Index (RII) is as follows:

$$RII = \frac{\sum W}{A \times N} \quad (1)$$

Where: Σ = Summation, W = the weights of every one of the factors given by respondents and it was in the range of (1 - 5), (A=5) the largest value of weight (i.e. Highest factor) and finally N refers to the Total of number respondents.

ii. Mean Item Score

Mean Item Score is being ranked from 1.00 to 5.00 and they all have their decision rule as shown in Table 2. The formula for Mean item score (MIS) is as follows:

$$MIS = \frac{\sum W}{N} \quad (2)$$

Where: Σ = Summation, W = Weight, and N = Total
The decision rule adopted for the RII and MIS are summarised in Table 1.

Results and Discussion

The section presents the profile of respondents and also discusses the results of the analysis of data carried out.

Response Rate

Eighty-six (86) copies of questionnaire were administered to the respondents during the course of the field work. Of these 86 copies, seventy (70) was correctly filled, returned and used for the analysis. This gives a response rate of 81.4%. Ankrah (2007) had a response rate of 15.42% and expressed that the response rate normal for questionnaire surveys is 20 – 30%. In addition, 15.72% and 49.37% were the response rates in the studies of Agumba and Haupt (2014) and Shittu (2016) respectively. This therefore implies that the response rate in this study is adequate.

Barriers to Effective Materials Management

This section presents and discusses the RII results of the twenty (20) barriers to effective materials management. Table 2

reveals that *Lack of proper Work Plan, Transport Difficulties, Waste, Improper handling on Site, Inappropriate Material Delivery, Management of Surplus Materials, and Misuse of the Specification* with RII ranging from 0.81 – 0.84 are the most important barriers to effective materials management in building construction projects in Niger State. Other barriers to effective materials management in building construction projects in Niger State ranging between *Failure to order on Time* (RII = 0.81) and *Excessive paperwork* (RII = 0.72) are also important. On the average, the identified barriers to effective materials management in building construction projects in Niger State are important (average RII = 0.78). The findings here agree with that of Donyani and Flanagan (2009) where it was reported that these barriers identified can constitute a major obstacle in terms of purchasing and supply of materials not matching materials with the ordering purchase.

Table 1: Decision Rule for Data Analysis

SCALE	Cut-Off Point		Level of Importance	Interpretation	
	RII	MIS		Level of Significance	Level of Effectiveness
5	0.81 - 1.00	4.51 - 5.00	Very Important	Very Significant	Very Effective
4	0.61 - 0.80	3.51 - 4.50	Important	Significant	Effective
3	0.41 - 0.60	2.51 - 3.50	Fairly Important	Fairly Significant	Fairly Effective
2	0.21 - 0.40	1.51 - 2.50	Less Important	Less Significant	Less Effective
1	0.00 - 0.20	1.00 - 1.50	Least Important	Least Significant	Least Effective

Source: Adapted and Modified from Shittu *et al.* (2015)

Table 21 Barriers to Effective Materials Management in Construction Projects in Niger State

S/No.	Code	Barriers to Effective Materials Management	RII	Rank	Decision
1	B5	Lack of proper Work Plan	0.84	1st	Very Important
2	B2	Transport Difficulties	0.83	2nd	Very Important
3	B1	Waste	0.83	2nd	Very Important
4	B3	Improper handling on Site	0.83	2nd	Very Important
5	B6	Inappropriate Material Delivery	0.82	5th	Very Important
6	B20	Management of Surplus Materials	0.82	5th	Very Important
7	B4	Misuse of the Specification	0.81	7th	Very Important
8	B15	Failure to order on Time	0.80	8th	Important
9	B16	Lack of Communication	0.79	9th	Important
10	B14	Delivery at the Wrong Time	0.77	10th	Important
11	B18	Double handling of Materials	0.77	10th	Important
12	B12	Wrong Material	0.77	10th	Important
13	B8	Lack of Information	0.75	13th	Important
14	B17	Theft of Materials	0.74	14th	Important
15	B10	Subsequent design change	0.74	14th	Important
16	B13	Unavailability of Storage Space	0.73	16th	Important
17	B19	Not matching Materials	0.73	16th	Important
18	B9	Missing Material	0.73	16th	Important
19	B11	Over Ordering	0.73	16th	Important
20	B7	Excessive paperwork	0.72	20th	Important
Average RII			0.78		Important

Impact of Poor Material Management on the Cost and Time Delivery

The use of MIS was employed to examine the impact of poor material management on the cost and time delivery of construction projects based on the respondents' perception. The MIS results on the impact of poor material management on the cost and time delivery of construction projects are presented in Tables 3 and 4. Table 3 summarises the results of the impact of poor material management on the cost delivery of construction projects, while that of the impact of poor material management on the time delivery of construction projects is summarised in Table 4.

Table 3 reveals that the most significant impact of material management on the cost delivery of construction projects are *Better cash flow Management* (MIS = 4.31) and *Reduction in Material Surplus* (MIS = 4.30). The other impact of material management on the cost delivery of construction projects are also significant. These range from *Quality Control* (MIS = 4.26) to *Stock Reduction* (MIS = 3.90). Averagely, all the identified impact of material management on the cost delivery of construction projects are also significant in Niger State are significant (average MIS = 4.12)

It is shown in Table 4 that the most significant impact of material management on the time delivery of construction projects are *Reduction in energy Consumption* (MIS = 4.43) and *Availability of material* (MIS = 4.39). *Sufficient quantity of material*, *Incorrect bill of material*, *Material procurement*, *Storage changes*, and *Inaccurate cycle counts* with MIS of 4.23, 4.23, 4.19, 3.93 and 3.73 respectively also have significant impact on the time delivery of construction projects. *Shipping error* and *Receiving error* with MIS of 3.50 and 3.43 respectively are shown to be fairly significant impact of material management on the time delivery of construction projects. On the average, all the impacts of material management on the time delivery of construction projects in Niger State are significant with average MIS of 4.01.

The findings of this section are in line with the study of Adafin *et al.* (2010). Adafin *et al.* (2010) reported that poor material management can lead to issues with the timeline for the entire project. Therefore effective practice of materials management plays a key role in the successful completion of a project in terms of cost and time delivery. Hence, construction material management is of central importance to the

economic development of the construction industry.

Cost Control Techniques for Improving Materials Management

The study employed the use of MIS to examine the level of effectiveness of the identified cost control techniques for improving materials management in construction projects based on the opinion of the respondents. Table 5 shows five (5) major cost control techniques for improving material management in construction projects. Table 4.8 reveals that *Planning the Project Budget* (MIS = 4.61) is the most effective cost control techniques for improving material management in construction projects. It was also shown that *Effective Time Management, Keeping a track of costs, Use of Earn Value* and *Project Change Control* with MIS of 4.46,

4.1, 4.24 and 4.17 respectively are also effective cost control techniques for improving material management in construction projects. It was also revealed that all the identified cost control techniques for improving material management in construction projects in Niger State are effective (average MIS = 4.8). This finding is synonymous with the finding of Sheriff *et al.* (2015). Sheriff *et al.* (2015) discovered that cost control techniques enhance the measuring and collecting of the cost record of a project. It was further stated that the techniques enhance work progress through the comparison of actual project with the planning, thereby bringing about gaining of maximum profit within designated period and satisfactory quality of work.

Table 3: Impact of Poor Materials Management on Cost Delivery of Construction Projects

S/No	Code	Cost Impact of Poor Materials Management	MIS	Rank	Decision
1	C1.2	Better cash flow Management	4.31	1st	Significant
2	C1.1	Reduction in Material Surplus	4.30	2nd	Significant
3	C1.8	Quality Control	4.26	3rd	Significant
4	C1.12	Control of Materials on Site	4.26	3rd	Significant
5	C1.5	Improvement in labour Productivity	4.23	5th	Significant
6	C1.7	Labour Saving	4.14	6th	Significant
7	C1.10	Better handling of Material	4.11	7th	Significant
8	C1.4	Reduction in Duplicated Order	4.09	8th	Significant
9	C1.6	Reduce Cost of Material	4.06	9th	Significant
10	C1.11	Good Relationship with Suppliers	4.00	10th	Significant
11	C1.13	Material Waste Reduction	3.96	11th	Significant
12	C1.3	Stock reduction	3.90	12th	Significant
13	C1.9	Stock Reduction	3.90	13th	Significant
<i>Average MIS</i>			<i>4.12</i>		<i>Significant</i>

Table 4: Impact of Poor Materials Management on Time Delivery of Construction Projects

S/No	Code	Time Impact of Poor Materials Management	MIS	Rank	Decision
1	C2.1	Reduction in energy Consumption	4.43	1st	Significant
2	C2.2	Availability of material	4.39	2nd	Significant
3	C2.4	Sufficient quantity of material	4.23	3rd	Significant
4	C2.8	Incorrect bill of material	4.23	4th	Significant
5	C2.3	Material procurement	4.19	5th	Significant
6	C2.9	Storage changes	3.93	6th	Significant
7	C2.7	Inaccurate cycle counts	3.73	7th	Significant
8	C2.5	Shipping error	3.50	8th	Fairly Significant
9	C2.6	Receiving error	3.43	9th	Fairly Significant
<i>Average MIS</i>			<i>4.01</i>		<i>Significant</i>

Table 5: Cost Control Techniques for Improving Material Management in Construction Projects

S/No	Code	Cost Control Techniques	MIS	Rank	Decision
1	D1	Planning the Project Budget	4.61	1st	Very Effective
2	D3	Effective Time Management	4.46	2nd	Effective
3	D2	Keeping a track of Costs	4.41	3rd	Effective
4	D5	Use of Earn Value	4.24	4th	Effective
5	D4	Project Change Control	4.17	5th	Effective
<i>Average MIS</i>			<i>4.38</i>		<i>Effective</i>

Conclusion and Recommendations

The study identified a problem of contractors' ineffective ability to exercise cost control on materials management during construction activities which automatically results in time and cost overrun in building projects it is observed that many contractors are facing the problem of. This necessitated an evaluation of the effect of material management on the delivery of building construction projects in Niger State with a view to improving the cost, quality and time performance of construction projects. Data were collected from professionals in (4) Government Ministries in Minna who are in-charge of the execution of housing and construction projects in Niger State with the adoption of questionnaire survey. Analysis of data was carried out with the use of descriptive statistical techniques such as Mean Item Score (MIS) and Relative Importance Index (RII).

As a result of the findings from the data analysis carried out for this study, it was revealed that all the identified barriers to effective materials management in building construction projects in Niger State are important but *Lack of proper Work Plan, Transport Difficulties, Waste, Improper handling on Site, Inappropriate Material Delivery, Management of Surplus Materials, and Misuse of the Specification* are the most important barriers to effective materials management in building construction projects. It was also shown that all the identified impact of material management on the cost delivery of construction projects are also significant in Niger State but the most significant impact of material management on the cost delivery

of construction projects are *Better cash flow Management and Reduction in Material Surplus*. All the impacts of material management on the time delivery of construction projects in Niger State are significant but the most significant impact of material management on the time delivery of construction projects are *Reduction in energy Consumption and Availability of material*.

Finally, the study indicated that all the identified cost control techniques for improving material management in construction projects in Niger State are effective but *planning the project budget* is the most effective cost control techniques for improving material management in construction projects. It can therefore be concluded that the barriers to effective materials management in building construction projects in Niger State are important. Therefore, material management at construction sites has a significant effect on the delivery of building construction projects in Niger State is significant.

In view of the findings and conclusion of this study, it is recommended that more attention should be directed towards addressing the problems of *Lack of proper Work Plan, Transport Difficulties, Waste, improper handling on Site, Inappropriate Material Delivery, Management of Surplus Materials and Misuse of the Specification*. This will enhance effective materials management on construction sites. Government should also ensure that the main objectives of its construction projects are set to achieve better cash flow management and reduction in material surplus. This is to improve the cost and time

performance of construction projects in Niger State.

In addition, all relevant stakeholders should ensure total implementation of the cost control techniques for improving material management in construction projects in order to avoid cost and time overrun especially planning the project budget. This study did not address the impact of materials management on the quality delivery of construction projects due to time constraint.

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Effects of Disputes on the Delivery of Construction Projects in Abuja

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Studies have globally revealed that disputes are an endemic feature in the construction industry. When not properly resolved, they may escalate and ultimately require litigation proceedings, which can be costly for the parties concerned because disputes cause delay in completion time of a project and increase in cost which in turns causes dissatisfaction among parties involved. This study evaluated the effects of disputes on construction project delivery with a view to suggesting strategies for eliminating disputes in construction projects. Data were collected from selected construction firms based in Abuja through the use of structured questionnaires in which 74 copies of questionnaire were distributed and 49 retrieved. Relative Importance Index (RII) and Mean Item Score (MIS) were employed for the analysis of data. Findings from the research revealed ambiguity in the formulation of contract as the most severe cause of disputes (MIS = 4.79); extended or more complex award process was the major effect of dispute in construction projects (MIS = 4.79); and understanding contractual document before proceeding into agreement was the most effective strategy for controlling the effects of disputes on construction projects for improved construction project delivery (RII = 0.98). It was concluded that disputes have a significant effect on the delivery of construction projects in Abuja. It was thus recommended that parties to a contract should ensure that mechanism is put in place to effectively implement the identified strategies for controlling the effect of disputes so as to prevent ambiguity in the formulation of contract, contract administration, error in pricing or costing, and improper project scheduling by the contractor for the avoidance of disputes in construction projects.

Keywords: Construction, Delivery, Disputes, Effect, Projects.

Introduction

The construction industry is one of the major sectors that enhance the growth of a nation in terms of employment and wealth generation. Projects are imagined and pictured with the prevision of achieving the primary objective of timely completion. Disputes in construction projects are considered an inevitable problem in a construction project. As discussed by Ghada *et al.* (2015) that being a very complex and competitive industry in which participants with different expertise, talents, and levels of knowledge work together to achieve set objectives, conflicts become inevitable in

the construction industry. Ghada *et al.* (2015) further emphasised that if conflicts are not well managed and resolved promptly, they quickly turn into disputes, which prevent the successful completion of the construction project. Disputes are therefore an endemic feature in the construction industry. When not properly resolved, they may escalate and ultimately require litigation proceedings, which can be costly for the parties concerned (Thobakgale *et al.*, 2014).

Disputes can cause delay in completion time of a project, increase in cost which in turns

causes dissatisfaction among parties involved. Disputes often result in drawbacks and disharmony in completing the construction projects with considerable cost (Ayudhya, 2011). Prasad *et al.* (2019) reported that finance related causes are the most critical causes of drawbacks in construction projects. Disputes between contractors and client often lead to cost and time overruns (Karthikeyan *et al.*, 2017). It was emphasised that conflict brings breakdown of relationships between project participants and results to project delays, claims and disputes which are the main shortcomings in completion of the project within objectives and goal. Effects of delays are the consequences that will occur when the causes of disputes are not identified and resolved in time. Project can be regarded as successful when it is timely completed to satisfy the customers with no problems in terms of time, quality and budget allocation. Thobakgale *et al.* (2014) reported that disputes in the construction industry are often lengthy, complex and expensive to resolve. Their effects are that they can cause long term damage to the commercial relationship between the parties. Clients and main contractors should take careful steps in order to minimize disputes that are likely to occur. The key objective to prevent disputes is to identify dispute problems that frequently occur during construction phase from each party involved. In view of this, Ayudhya (2011) categorized disputes into four main dispute problems which are, contract and specification, financial, environmental and other common disputes.

In Nigeria, it was observed that the performance of the construction industry in terms of time was poor (Owolabi *et al.*, 2014). Chan and Kumaraswamy (2014) emphasised that timely delivery of projects within budget and to the level of quality standard specified by the client is an index of successful project delivery. It was also noted that failure to achieve targeted time, budgeted cost and specified quality result in various unexpected negative effects on the projects. Therefore, from the works of Owolabi *et al.* (2014) and Chan and Kumaraswamy (2014), the main problem is

that disputes in construction project results in additional cost, time and abandonment of projects which give rise to dissatisfaction to all the parties involved in the construction project. It is as a result of this background that this study is evaluating the effects of disputes on construction project delivery. To achieve this aim, the study identified the factors responsible for disputes in construction projects; examined the effect of disputes in construction projects; determined the effects of disputes on cost and time performance of construction projects; and examined the major strategies for minimising the effect of disputes on construction projects.

Literature Review

Concept of Dispute in the Construction Industry

Cheung and Pang (2010) defined construction dispute as the incompatibility of two (or more) people's (or groups) interest, needs or goals. Kehakale and Funtase (2015) defined dispute as the assertion of a claim by one party and repudiation thereof by another. Kehakale and Funtase (2015) further asserted that a claim can neither be called a claim without repudiation, nor can it be referred to as a pair of claim and counter claim. Chen *et al.* (2014) reported that "interaction-ism" posits that all social structures have inherent conflicts within them that can yield positive or negative effects on the organisation's performance. In the construction industry, disputes become inevitable due to the complex, multidisciplinary relationships which exist among different stakeholders, and also due to the lengthy processes involved from design to construction phases of projects (Nwakor *et al.*, 2017). The construction industry world over is a complex and competitive environment in which participants have different views, talents and levels of knowledge of the construction process work together (Owenaze, 2016). Therefore, in this complex environment, participants from various professions each has its own goals and each expects to make the most of its own benefits in the construction industry, since differences in perceptions among the

participants of the projects, conflicts are inevitable. (Owenaze, 2016). If conflicts are not well managed; they quickly run into disputes (Khekale *et al.*, 2013). Claim is another source of dispute in the construction industry. According to Khekale and Futane (2015), during the execution of a project, several issues arise that cannot be resolved among project participants. Such issues typically involve the contractor requesting for either time extension or reimbursement of an additional cost, or sometimes both. Such requests by the contractor are called 'claim'. If the client accedes to the claim of the contractor and grants him an extension of time or reimbursement of additional cost, or both, the issue is sorted out. However, if the client does not agree to the claim put out by the contractor and there are differences in the interpretations, the issue takes the form of dispute.

Types of Disputes

Dispute may be considered in three levels namely; intrapersonal dispute, interpersonal dispute and intra-group dispute (Opata *et al.*, 2015). Intrapersonal dispute is the dispute that takes place within the individual, interpersonal dispute is the dispute experienced between individuals in the same group or unit for example coworkers, roommates, unit members and etc. Such disputes exist whenever people interact or come together to accomplish a common goal or objective. Intra-group dispute is the conflict between groups in the same organisation, team or command. The interpersonal and intragroup disputes can further be categorized into three types: the relationship, task and process dispute (Carmen *et al.*, 2013).

Relationship or emotional dispute is a perception of interpersonal incompatibility and typically includes tension, annoyance, and animosity among group members (Opata *et al.*, 2015). Opata *et al.* (2015) stressed further that conflict negatively affects group decision quality in three ways. First, it limits information processing ability of the group because the group members spend most of the time and energy focusing on each other rather than on the group

problems. Second, it limits group members' cognitive functioning by increasing their stress and anxiety levels and third, it encourages antagonistic or sinister attributions for other group members' behaviour, which can create a self-fulfilling prophecy of mutual hostility and conflict escalation.

Task or cognitive conflict is a perception of disagreements among group members about the content of their decisions and involves differences in viewpoints, ideas, and opinions. Simons and Peterson (2000). They further noted that task conflicts run a substantial risk of triggering detrimental relationship conflict. And that task conflict leads to relationship conflict through a process of misattribution. Carmen *et al.* (2013) defined process conflict as an awareness of controversies about aspects of how task accomplishment will proceed. It pertains to issues of duty and resource allocation such as; who should do what or how much one should get. This may happen when for instance group members disagree about whose responsibility is to carry out and complete a specific duty.

Factors Responsible for Disputes in Construction Projects

There are specific factors which have been identified to be responsible for disputes in the construction industry. Thobakgale *et al.* (2014) categorised disputes into the following groups as follows; construction related causes, financial/economical, management and contract related causes of disputes. Construction related causes of dispute according to Farooqul *et al.* (2014), depicts that unrealistic information expectations, unclear risk allocation, and unfair risk allocation are those causes occurring most frequently and contributing in arising of disputes in the projects. According to Thobakgale *et al.* (2014), financial/economical causes of disputes elaborate that project participant's default is the most frequent cause of dispute and rising value of national currencies is the most severe cause of disputes in construction projects, also their severity and frequency is respectively high. Whereas inadequate

financial strength of the project participants is also very severe and frequent cause of dispute in the construction projects described by most construction professionals (Thobakgale *et al.*, 2014).

Management related causes of disputes are also common (Thobakgale *et al.*, 2014). Applying construction management tools and techniques and observing a sound project management system, majority of the causes of disputes can be avoided thereby reducing the chances that any dispute arises in the first place and if such thing come about it does not escalate to such a level that it is converted into a major conflict or breach of contract (Thobakgale *et al.*, 2014). According to Bielefeld & Rusch (2006), a building contractor is responsible for supervising the quality of the building work. Disputes may occur if the contractor does not have adequate contractor's management, supervision and coordination and fails to plan and execute the changes of works. Reluctance to seek clarification can lead to serious disagreements between the construction team as the final product will not be achieved as specified (Thobakgale *et al.*, 2014).

Contract related causes of disputes is another common causes of disputes (Thobakgale *et al.*, 2014). Contracts often represent a tool that companies use to safeguard their resources. If there are flaws in the formulation of contract documents, ambiguous language of the contract can be a cause of dispute. These causes and many others relevant to the domain of contract have a high potential to be the source of diverse types of disputes (Thobakgale *et al.*, 2014). Nwakor *et al.* (2017) identified issues bothering on variation, the extension of time, payments, quality of technical supervision, availability of adequate information, administration and management, unrealistic clients' expectations and determination. Kathleen (2003) identified other factors such as insufficient resources of time, materials, labour and/or equipment. Cheung & Seun (2002) noted that delay in the execution of projects by either the contractor or the client

is a major cause of dispute in the industry. He also noted that delayed interim payments from the client, improper project scheduling by the contractor, delayed response from the Architect during application of extension of time by the contractor, poor or perceived poor quality of work, error in pricing or costing, discrepancies in contract documents and documentation; disagreements over the nature, extent and scope of work, poor valuation of variations by the quantity surveyor and late instruction from the Architect or Engineer causes disputes. Oladipo and Onabanjo (2009) noted that incessant contractor's claims and client's reluctance to settle monies due to contractors generate more crises. Turner (2005) identified several conditions that can cause disputes namely: whether or not work is done to the specified standards, whether work is or not a variation, pricing variation, whether instructions are adequate or late, whether a valuation or financial certificate is adequate or late, whether completion is likely to be delayed, whether regular progress is being disrupted and ascertainment of loss and/or expense.

Effects of Disputes on the Performance of Construction Projects

Disputes generate several negative consequences both to the industry and the national economy at large (Nwakor *et al.*, 2017). Kathleen (2003) identified the breakdown in communication and professional relationship; reduction in productivity, tension and dampness of team spirit as some of the negative consequences of disputes in the construction industry. According to Mashwama *et al.* (2014), the effects of construction dispute can cripple a company and bring it to its knees, and the effects are additional expense in managerial and administration, Possibility of litigation cases, time delays and cost overruns, extended or more complex award process, diminution of respect between parties and deterioration of relationship and break down in cooperation. While Love *et al.* (2007) claims that loss of company reputation, loss of profitability and perhaps business viability, loss of professional reputation, rework and relocation cost for men,

equipment and materials, time and cost overruns are the effects of construction dispute. Conflict brings breakdown of relationships between project participants and results to project delays, claims and disputes which are the main shortcomings in completion of the project within objectives and goal (Karthikeyan *et al.*, 2017). Construction conflicts affect the interests of many stakeholders in connection with big investments, they reduce profits and are therefore very expensive and unprofitable (Awakul & Ogunlana, 2002). The construction industry is dynamic in nature due to the uncertainties in technology, budget and development process. If disputes are not resolved promptly, they drag on and escalate and can cause project delays, lead to claims, require litigation proceedings for resolution and ultimately destroy business relationships (Karthikeyan *et al.*, 2017).

Strategies for Controlling the Effect of Disputes on Construction Projects

Nwakor *et al.* (2017) noted that the management of construction disputes is a decisive test of the emotional and intellectual maturity of construction stakeholders. Therefore, Nwakor *et al.* (2017) concentrated on those factors which will eliminate or reduce construction disputes to the barest minimum in order to improve contract administration. Some precautions need to be adopted to reduce the incidence and prevalence of construction disputes. These measures are supported by Turner (2005), Ryan (2015), Chen *et al.* (2014) and Oke and Lawal (2013). They include: (1) specifying the method(s) of resolving disputes favourable the parties in the contract from the outset; (2) documents intended as contract documents must be stated and signed by the parties to the contract; (3) contractors/subcontractors should keep good adequate and continuous site diaries; (4) the architect should keep a log of things that are going on as well as items that are present on site; (5) the quantity surveyor should annotate dimensions, notes and figures (with dates) gleaned for the purposes of interim valuations or final measurement; (6) if an Architect's Instruction is not intended as a

variation, it should be clarified; (7) it is better to seek acknowledgment; (8) it is better to talk, not argue as argument flares temper which could lead to later regrets; (9) always refer back to notes and contract to check the authenticity of your claims; (10) resolve each issue rather than dissolving the relationship; (11) if a change of product or of execution is suggested by the contractor, it should be made clear whether this is a variation or not; and (12) when applying for the extension of time, the applicant should think in terms of the provision of the relevant conditions of contract. Ramonu *et al.* (2018) identified the following strategies to prevent disputes in construction projects: (i) understanding contractual document before proceeding into agreement; (ii) designing contract conditions that are fair to all parties (allocating projects risks fairly to all parties); (iii) proper planning and organisation of payment and schedule; (iv) maintaining a good relationship between the clients, professionals and workers; (v) payment as at when due; (vi) engaging the organisation trained artisans/labourers; and (vii) engaging the organisation professionals.

Research Methodology

This study adopted the quantitative approach with the use of well-structured questionnaire survey to collect data from professionals directly involved in construction projects within Abuja. The population for this study constituted top professionals in building construction firms within Abuja. This research used a population size of 289 construction firms registered with Federal Inland Revenue Service (FIRS) as at 2018. The number of firms that were considered for the study from the population size of the 289 construction firms registered with FIRS were chosen with the use of purposive sampling technique. The criteria for the selection is the possession of active construction sites by the firms. In view of this, 74 construction firms with active construction sites were considered for the study. Therefore, 74 copies of questionnaire were distributed across the targeted construction firms. A total of forty-nine (49)

copies of questionnaire were retrieved at the end of the survey. This gives a response rate of 66.20%.

Data collection for the study was carried out using well-structured questionnaire divided into five sections (A, B, C, D and E). Section A considered the respondents' profile and some information related to the firms. Sections B – E addressed the research objectives respectively. The questionnaire was designed on a five-point Likert scale format. The descriptive method of analysis was adopted to analyse the data collected using Mean Item Score (MIS) and Relative Importance Index (RII). The decision rule adopted for the RII and MIS are summarised in Table 1.

Results and Discussion

Respondents' Profile

This section shows the demographic characteristics of respondents that contributed to the research. Highlight of the respondents' demographics are given in Tables 2 and 3. Table 2 presents information on the profession of the respondents while

the years of experience of respondents is presented in Table 3.

From Table 2, it was shown that 33% of the respondents are Architects, 39% are Quantity Surveyors, 10% are Builder and 18% are Civil Engineers. Majority of the respondents are Quantity Surveyors with 39%. Therefore, the respondents are experts who can provide reliable data.

Table 3 showed that 18% of the respondents have less than 5 years of experience, 37% of the respondents are between the years of experience of 5 and 10 years, 31% of the respondents have their years of experience ranging from 10 – 15 years and 14% of the respondents have 15 years above experience. In summary, it is noted that the years of experience of most (68%) of the respondents range from 5 – 15 years. This shows that majority of the respondents have reasonable experience in order to be able to provide reliable information required to manage disputes on site.

Table 1: Decision Rule for Data Analysis

SCALE	Cut-Off Point		Interpretation		
	RII	MIS	Level of Importance	Level of Significance	Level of Effectiveness
5	0.81 - 1.00	4.51 - 5.00	Very Important	Very Significant	Very Effective
4	0.61 - 0.80	3.51 - 4.50	Important	Significant	Effective
3	0.41 - 0.60	2.51 - 3.50	Fairly Important	Fairly Significant	Fairly Effective
2	0.21 - 0.40	1.51 - 2.50	Less Important	Less Significant	Less Effective
1	0.00 - 0.20	1.00 - 1.50	Least Important	Least Significant	Least Effective

Source: Adapted and Modified from Shittu *et al.* (2015)

Table 2: Profession of Respondents

Category	No of Respondent	Percentage%
Architects	16	33
Quantity Surveyor	19	39
Builder	5	10
Civil Engineer	9	18
Total	49	100

Factors Responsible For Disputes in Construction Projects

Table 4 revealed sixteen (16) factors responsible for dispute in construction projects identified from review of literature. It was shown that the most important factors responsible for disputes in Construction Projects in Abuja are: ambiguity in the formulation of contract; poor contract administration; error in pricing or costing; and improper project scheduling by the contractor with MIS of 4.79, 4.71, 4.61 and 4.59 respectively. Eleven (11) other factors were also shown to be important. These range from discrepancies in contract documents and documentation to delayed response from the

Architect during application of extension of time, in descending order with MIS ranging from 3.69 – 4.40. The least ranked item was unrealistic information expectations with MIS of 3.47 and it was shown to be fairly important. On the average, the identified factors responsible for dispute in construction projects in Abuja are important (average MIS = 4.20). The finding here is in line with the findings of Thobakgale *et al.* (2014), Farooq *et al.* (2014) and Nwakor *et al.* (2017) where it was also affirmed that all these identified factors responsible for dispute in construction projects are important.

Table 3: Respondent Years of Experience

Years of Experience	No of Respondent	Percentage%
Less than 5 years	9	18
5 – 10 years	18	37
10 – 15 years	15	31
15 years above	7	14
Total	49	100

Table 4: Factors Responsible for Dispute in Construction Projects in Abuja

S/No	Factors Responsible For Dispute in Construction Project	MIS	Rank	Decision
1	Ambiguity in the formulation of contract	4.79	1 st	Very Important
2	Poor contract administration	4.71	2 nd	Very Important
3	Error in pricing or costing,	4.61	3 rd	Very Important
4	Improper project scheduling by the contractor	4.59	4 th	Very Important
5	Discrepancies in contract documents and documentation	4.40	5 th	Important
6	Insufficient resources of time, materials, labour and/or equipment.	4.33	6 th	Important
7	Late instruction from the Architect or Engineer	4.20	7 th	Important
8	Inadequate financial strength of the project participants	4.18	8 th	Important
9	Delayed interim payments from the client,	4.16	9 th	Important
10	Disagreements over the nature, extent and scope of work	4.08	10 th	Important
11	Poor valuation of variations by the quantity surveyor	4.00	11 th	Important
12	Delay in the execution of projects by either the contractor or the client	4.00	11 th	Important
13	Unclear risk allocation	3.96	13 th	Important
14	Poor or perceived poor quality of work	3.96	13 th	Important
15	Delayed response from the Architect during application of extension of time	3.69	15 th	Important
16	Unrealistic information expectations	3.47	16 th	Fairly Important
Average MIS		4.20		Important

Effects of Disputes in Construction Projects

It was shown in Table 5 that the most significant effects of disputes in construction projects are: extended or more complex award process; additional expense in managerial and administration; and time delays and cost overruns with MIS of 4.79, 4.69 and 4.69 respectively. The other effects identified are also shown to be significant. These are deterioration of relationship and break down in cooperation; tension and dampness of team spirit; reduction in productivity; breakdown in communication and professional relationship; loss of company reputation; loss of professional reputation; and loss of profitability and business viability with MIS of 4.39, 4.33, 4.20, 4.10, 3.98, 3.92 and 3.71 respectively. On the average, all the effects of disputes in construction projects in Abuja identified are significant (average MIS = 4.28).

Effects of Disputes on Cost Performance of Construction Projects

Table 6 shows that, of the five (5) effects identified, the most significant effect of disputes on cost performance of construction projects is increase in project costs with MIS of 4.79. The other effects which are wastage and under-utilization of man-power and resources; tying down of client capital due to non-completion of the project; erosion of both profit and confidence; and delay in the progress of work with MIS of 4.41, 4.39, 4.29 and 3.89 respectively are also significant. On the average, all the identified effects of disputes on cost performance of construction projects in Abuja are significant (average MIS = 4.35).

Table 5: Effect of Disputes in Construction Projects in Abuja

S/No	Effect of Dispute in Construction Projects	MIS	Rank	Decision
1	Extended or more complex award process	4.79	1 st	Very Significant
2	Additional expense in managerial and administration	4.69	2 nd	Very Significant
3	Time delays and cost overruns	4.69	2 nd	Very Significant
4	Deterioration of relationship and break down in cooperation.	4.39	4 th	Significant
5	Tension and dampness of team spirit	4.33	5 th	Significant
6	Reduction in productivity	4.20	6 th	Significant
7	Breakdown in communication and professional relationship	4.10	7 th	Significant
8	Loss of company reputation	3.98	8 th	Significant
9	Loss of professional reputation	3.92	9 th	Significant
10	Loss of profitability and business viability	3.71	10 th	Significant
<i>Average MIS</i>		<i>4.28</i>		<i>Significant</i>

Table 6: Effects of Dispute on Cost Performance of Construction Projects

S/No	Effects of Dispute on Cost Performance of Construction Projects	MIS	Rank	Decision
1	Increase in project costs	4.79	1 st	Very Significant
2	Wastage and under-utilization of man-power and resources	4.41	2 nd	Significant
3	Tying down of client capital due to non-completion of the project	4.39	2 nd	Significant
4	Erosion of both profit and confidence	4.29	4 th	Significant
5	Delay in the progress of work	3.89	5 th	Significant
<i>Average MIS</i>		<i>4.35</i>		<i>Significant</i>

Effects of Disputes on Time Performance of Construction Projects

It was revealed in Table 7 that, of the five (5) effects of dispute on time performance of construction projects identified from literature review, three (3) are very significant. These are: delay in the progress of work (MIS = 4.89); wastage and under-utilization of man-power and resources (MIS = 4.59) and tying down of client capital due to non-completion of the project (MIS = 4.51). Erosion of both profit and confidence with MIS of 4.06 and increase in project costs with MIS of 3.59 are also shown to be significant. On the average, all the identified effects of dispute on time performance of construction projects in Abuja are significant with mean MIS of 4.33. The findings of this study on the effects of disputes in construction projects; the effects of disputes on the cost performance of construction projects; and the effects of disputes on the time performance of construction projects are in line with the studies of Mashwama *et al.* (2014), Nwakor *et al.* (2017) and Karthikeyan *et al.* (2017). This is because these studies revealed that conflict brings breakdown of relationships between project participants and results to project delays, claims and disputes which are the main shortcomings in completion of the project within objectives and goal.

Strategies for Controlling the Effect of Disputes on Construction Projects

Table 8 revealed nine (9) strategies for controlling the effect of disputes on construction projects identified from literature review. It was shown that all the identified strategies for controlling the effect of disputes on construction projects are effective. These range from understanding contractual document before proceeding into agreement (RII = 0.98) to engaging the organisation professionals (RII = 0.84) with an average RII of 0.89. The

research findings here agree with the findings from the studies of Turner (2005), Ryan (2015), Chen *et al.* (2014), Oke & Lawal (2013) and Nwakor *et al.* (2017) where it was found that these strategies can eliminate or reduce construction disputes to the barest minimum in order to improve contract administration.

Conclusion and Recommendations

It was found that the most important factors responsible for disputes in construction projects in Abuja are: (i) ambiguity in the formulation of contract; (ii) poor contract administration; (iii) error in pricing or costing; and (iv) improper project scheduling by the contractor. The most significant effects of disputes in construction projects are: (i) extended or more complex award process; (ii) additional expense in managerial and administration; (iii) time delays and (iv) cost overruns. The most significant effect of disputes on cost performance of construction projects is increase in project costs. The most significant effects of dispute on time performance of construction projects are: (i) delay in the progress of work; (ii) wastage and under-utilization of man-power and resources; and (iii) tying down of client capital due to non-completion of the project. Finally, it was found that all the identified strategies for controlling the effect of disputes on construction projects are effective. It is therefore concluded that disputes have a significant effect on the delivery of construction projects in Abuja.

Table 7: Effects of Dispute on Time Performance of Construction Projects

S/No	Effect of Dispute in Time Performance of Construction Projects	MIS	Rank	Decision
1	Delay in the progress of work	4.89	1 st	Very Significant
2	Wastage and under-utilization of man-power and resources	4.59	2 nd	Very Significant
3	Tying down of client capital due to non-completion of the project	4.51	2 nd	Very Significant
4	Erosion of both profit and confidence	4.06	4 th	Significant
5	Increase in project costs	3.59	5 th	Significant
Average MIS		4.33		Significant

Table 8: Strategies for Controlling the Effect of Disputes on Construction Projects

S/No	Strategies for Controlling the Effect of Disputes on Construction Projects	RJI	Rank	Decision
1	Understanding contractual document before proceeding into agreement	0.98	1 st	Very Effective
2	Designing contract conditions that are fair to all parties	0.94	2 nd	Very Effective
3	Contractors/subcontractors should keep good, adequate and continuous site diaries	0.94	2 nd	Very Effective
4	Proper planning and organization of payment and schedule	0.94	2 nd	Very Effective
5	Engaging the organization trained artisans/labours	0.86	5 th	Very Effective
6	The architect should keep a log of things that are going on as well as items that are present on site	0.84	6 th	Very Effective
7	Maintaining a good relationship between the clients, professionals and workers	0.84	6 th	Very Effective
8	Payment as at when due	0.84	6 th	Very Effective
9	Engaging the organization professionals in dispute resolution.	0.84	6 th	Very Effective
<i>Average MIS</i>		<i>0.89</i>		<i>Very Effective</i>

In view of the findings and the conclusion reached, the following recommendations are made:

i. Parties to a contract should ensure that mechanism is put in place in order to implement the measures for preventing ambiguity in the formulation of contract; poor contract administration; error in pricing or costing; and improper project scheduling by the contractor, so as to avoid disputes in construction projects.

ii. Parties to a contract should ensure that the identified strategies for controlling the effect of disputes on construction projects should be implemented to avoid extended or more complex award process; additional expense in managerial and administration; and time delays and cost overruns.

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